

# Bridging the Gap between Research & Practice in Professional Development February 7-8, 2006





# Research on Effective Professional Development

Iris Weiss

February 7, 2006





# What is High Quality Professional Development?

- Think about a particularly effective professional development session that you attended, and the factors that made it so effective.
- Share with your neighbor.



# High Quality PD

- When people listed attributes of effective PD, was there much that surprised you?



# Emerging Consensus

- Elmore (2002) summarized what he called an “emerging consensus” on quality PD, listing what many in the field believe to be the features of effective professional development:



# Professional Development: The Consensus View (Elmore, 2002)

- Focuses on a well-articulated mission or purpose anchored in student learning of core disciplines and skills
- Derives from analysis of student learning of specific content in a specific setting



- Focuses on specific issues of curriculum and pedagogy
  - Derived from research and exemplary practice
  - Connected with specific issues of instruction and student learning of academic disciplines and skills in the context of actual classrooms
- Embodies a clearly articulated theory or model of adult learning



- Sustains focus over time—continuous improvement
- Develops, reinforces, and sustains group work
  - Collaborative practice within schools
  - Networks across schools
- Involves active participation of school leaders and staff





- Models of effective practice
  - Delivered in schools and classrooms
  - Practice is consistent with message
- Uses assessment and evaluation
  - Active monitoring of student learning
  - Feedback on teacher learning and practice



- However, there is very little empirical evidence on the features of effective professional development.



## Writing about reform professional development:

*These principles and beliefs seem reasonable. Yet we know as little about what teachers learn in these kinds of forums as we do about what teachers learn in traditional staff development and in-service. Our readiness to embrace these new principles may, in fact, be rooted in a desire to escape collective bad memories of drab professional development workshops rather than in sound empirical work. But replacing our old conceptions of professional development with new makes sense only if the new ideas are held up for rigorous discussion and evaluation. New is not always right. (Wilson and Berne, 1999)*



# What **do** we know?

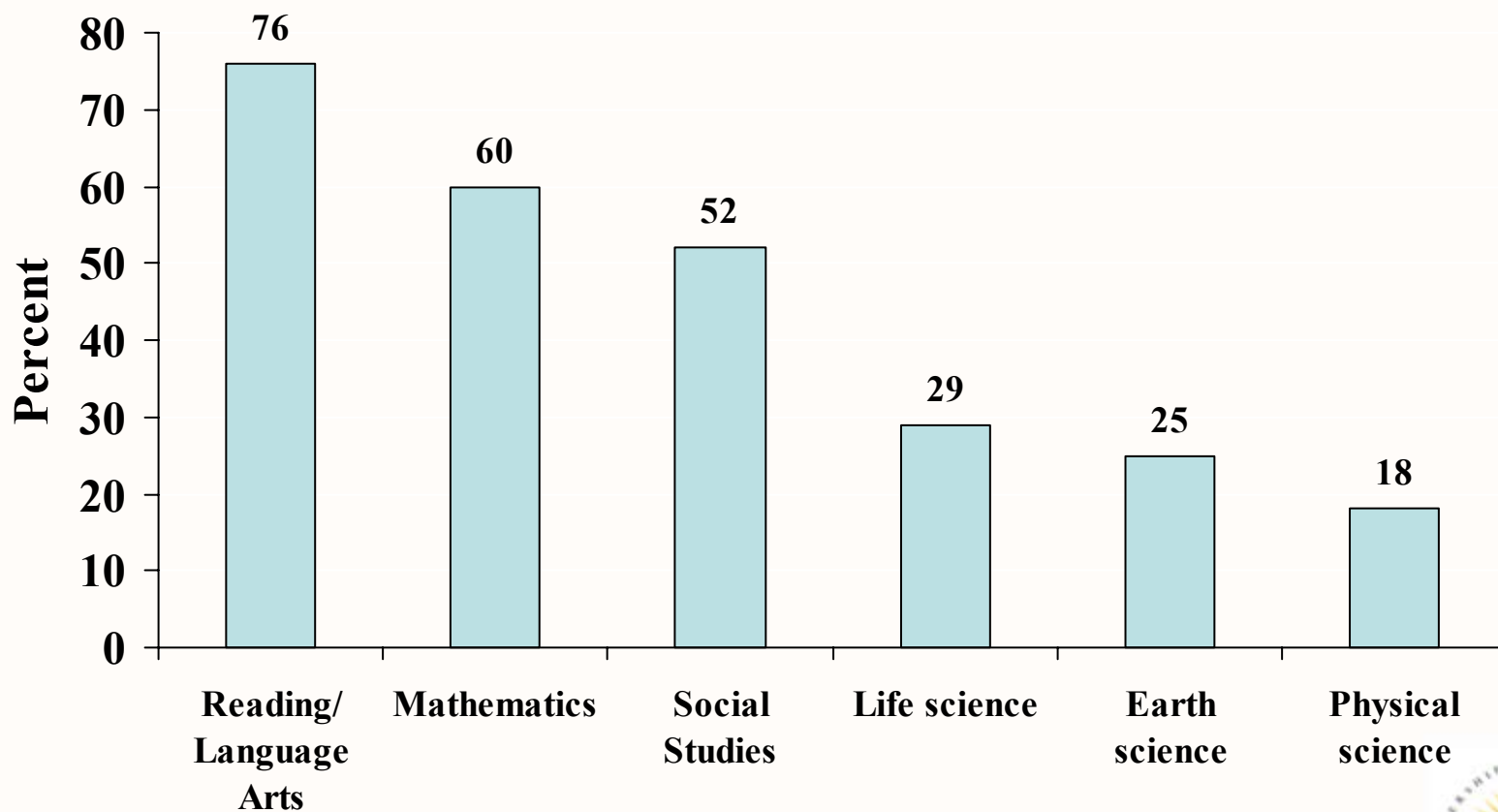
- First, we know there is a great need for effective PD, based both on teacher self-report and on classroom observation studies.



- Data from the 2000 National Survey of Science and Mathematics Education (Weiss, et al., 2001):

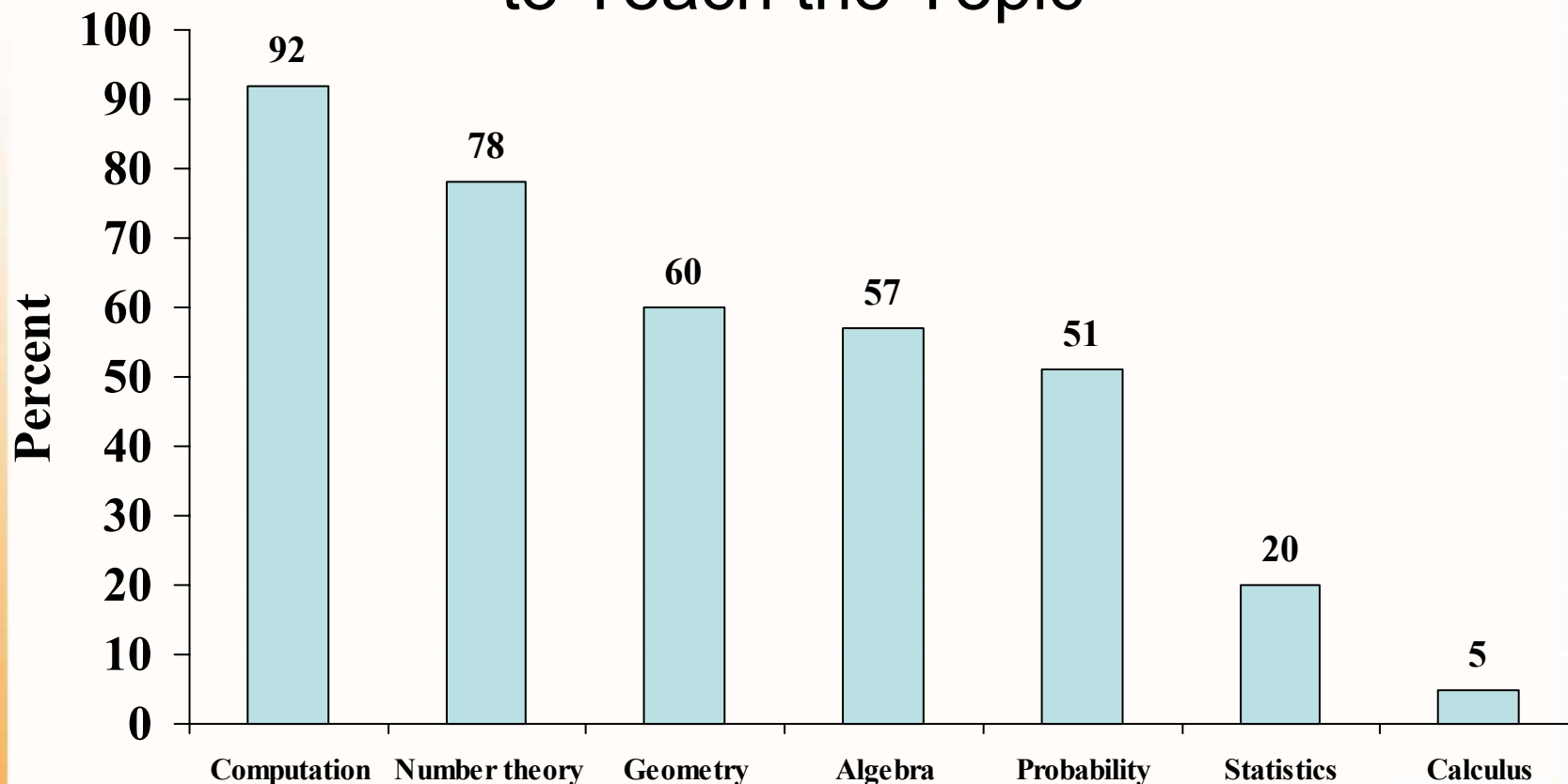


# Elementary Teachers Considering Themselves “very well qualified” to Teach the Subject





# Middle Grades Mathematics Teachers Considering Themselves “very well qualified” to Teach the Topic



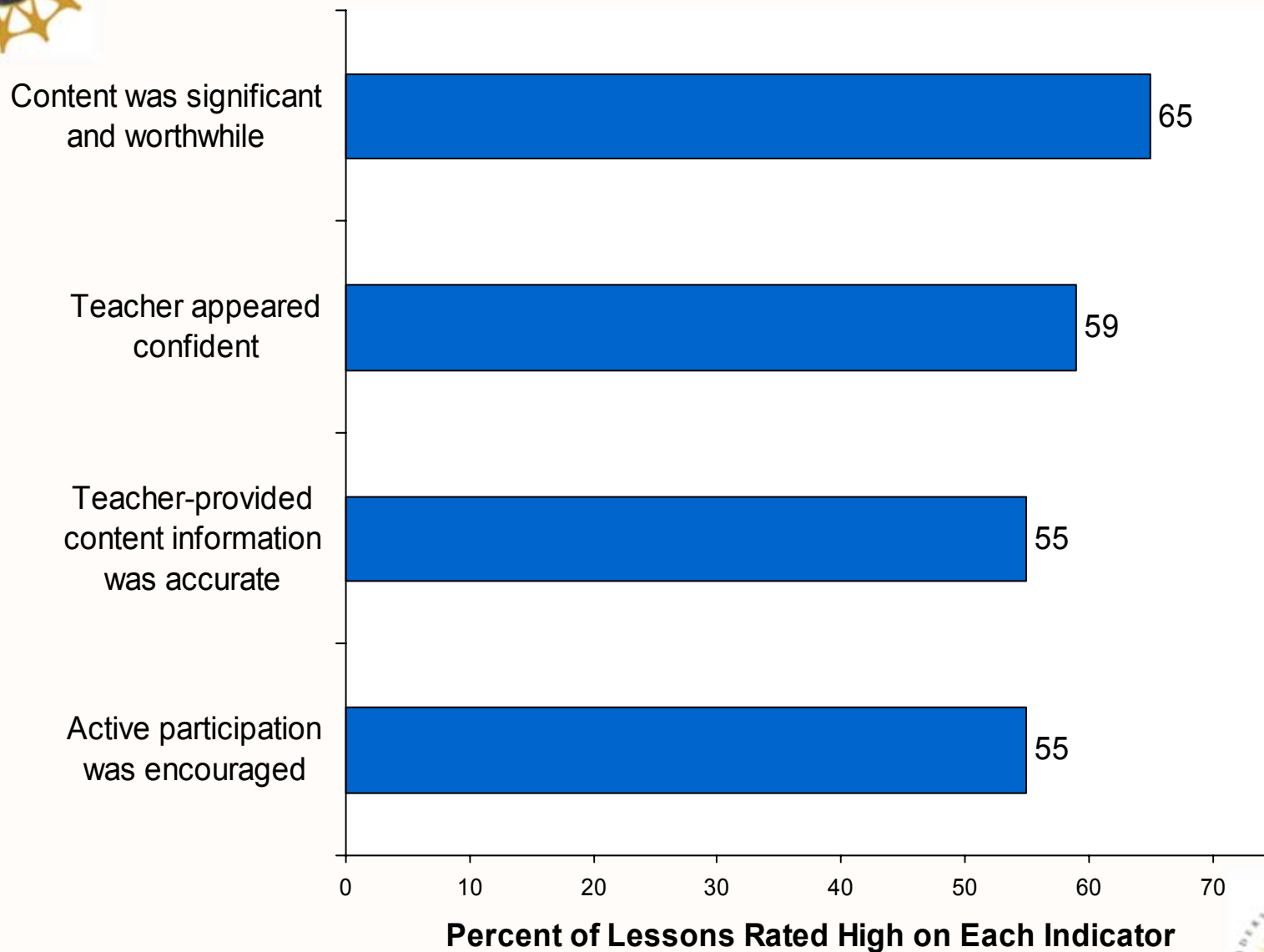


- Data from a national classroom observation study, *Looking Inside the Classroom: A Study of K-12 Mathematics and Science Education in the United States* (Weiss, et al., 2003):



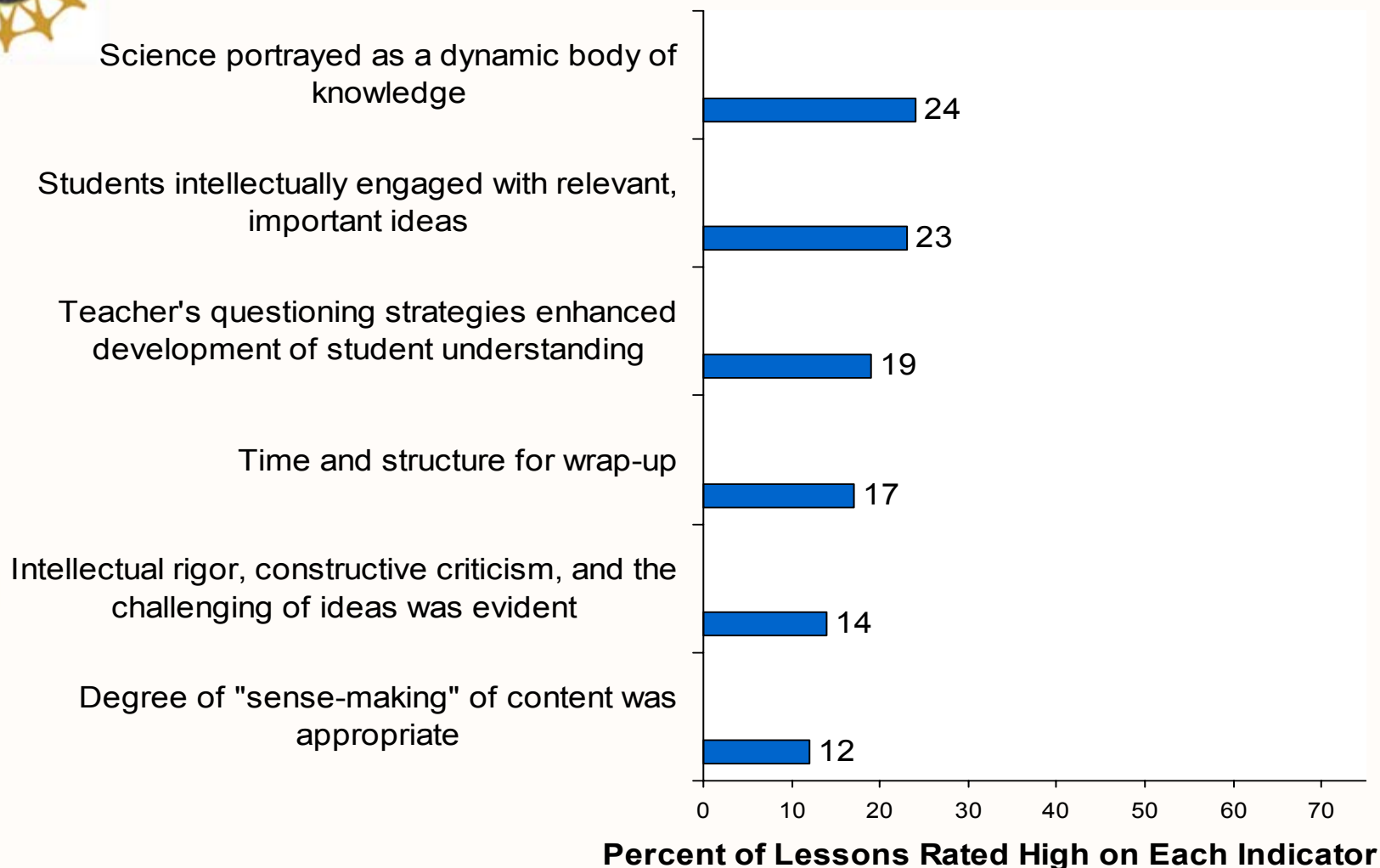


## Relative Strengths (K-8 Science)





## Major Weaknesses (K-8 Science)



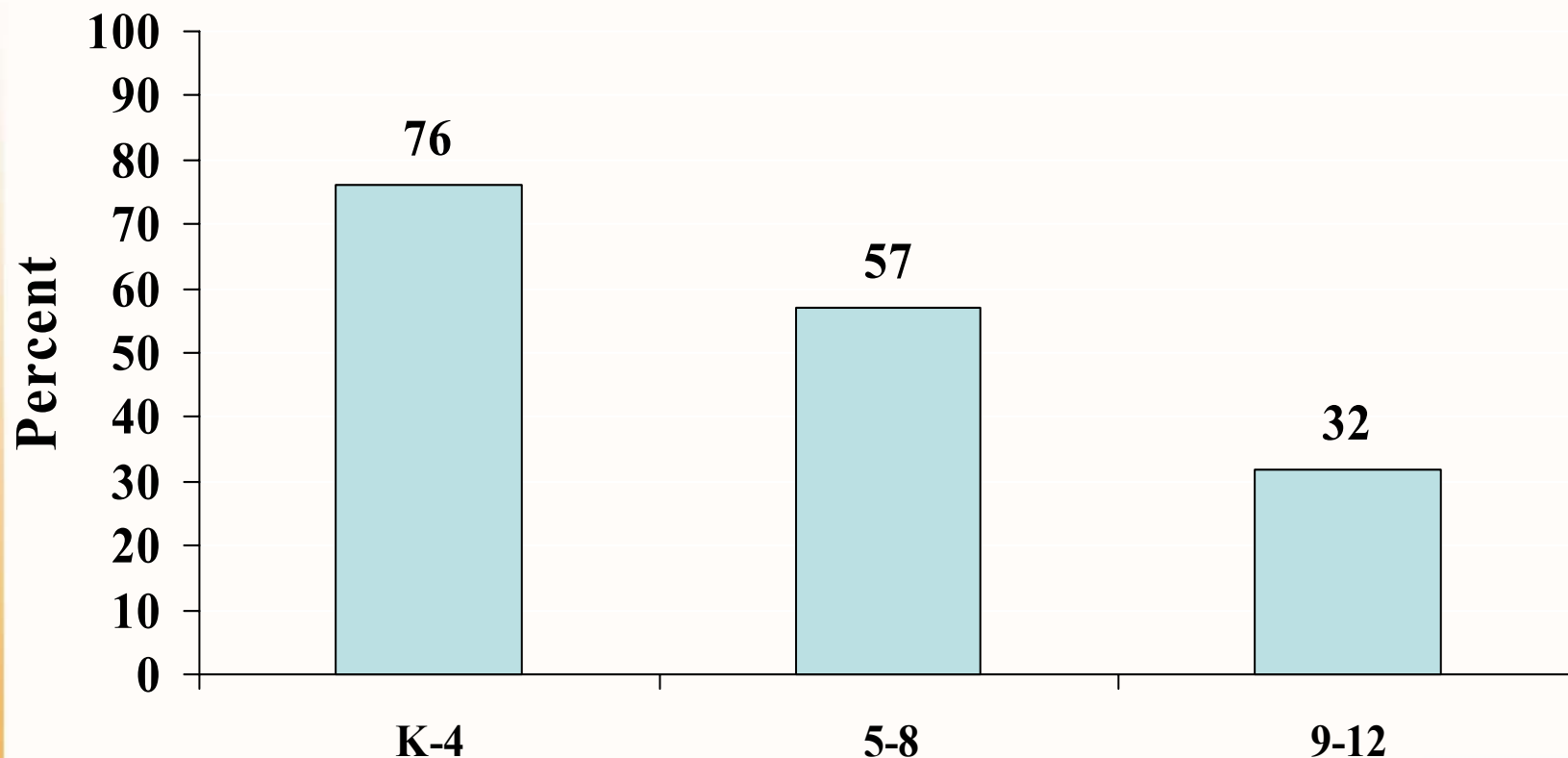


- These data have implications for both pre-service education and professional development.



# Teachers of Science

## With <16 hrs of Professional Development in Science/Science Education in Last 3 Years

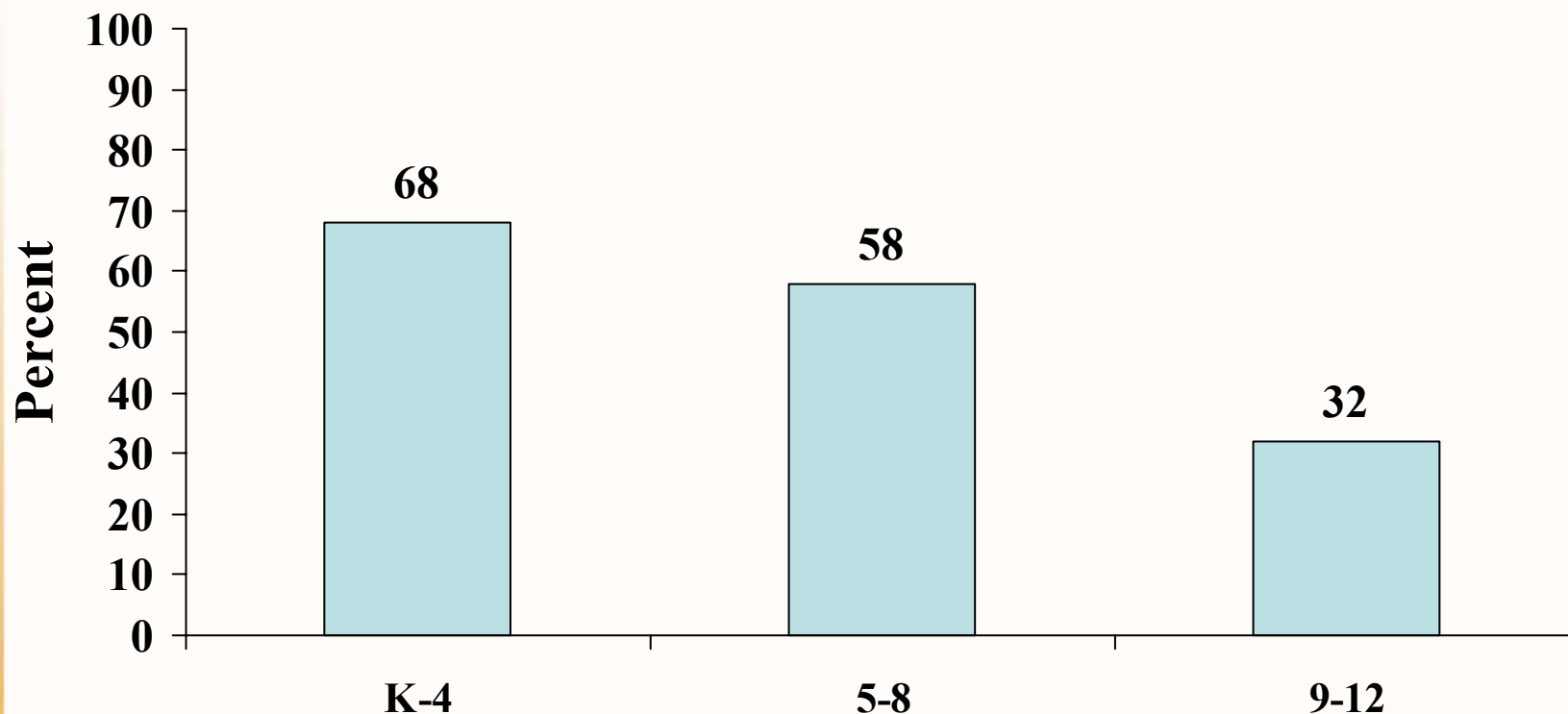


Report of the 2000 National Survey of Science and Mathematics Education (Weiss et al., 2001).



# Teachers of Mathematics

## With <16 hrs of Professional Development in Mathematics/Mathematics Education in Last 3 Years



Report of the 2000 National Survey of Science and Mathematics Education (Weiss et al., 2001).



- Clearly there is a need for more professional development to address teachers' needs.



- But especially given the limited time likely to be available, PD needs to be both effective and efficient.



# What does the empirical evidence tell us about effective PD?





- A study of Eisenhower supported professional development (Garet et al., 1999) provides support for a number of features of high quality PD highlighted by Elmore.



# Features of High Quality PD

- Focuses on content knowledge;
- Emphasizes active learning;
- Promotes coherence;
- Provides a large amount of training sustained over time; and
- Encourages collaboration among teachers.



- Teachers attending PD emphasizing content knowledge, active learning, and coherence reported enhanced knowledge and skills, and changes in teaching practice.



# Effective PD

## (Cohen and Hill, 2000)

- Teachers who reported opportunities to learn about student mathematics curriculum in PD reported more of the kind of classroom practice that the CA frameworks advocated.
- Student performance was related to teacher reports of curriculum-focused PD.



- Similarly, Hill and Ball (2004) found that content-focused PD led to improvements in teacher content knowledge.



# A Decade of Research on LSCs

- The Local Systemic Change Initiative (LSC), funded by NSF's Division of Elementary, Secondary, and Informal Education, built on the lessons learned in earlier NSF programs.
- Results from the LSC provide additional empirical support for content-based, instructional materials focused, PD.

Lessons from a Decade of Mathematics and Science Reform: A Capstone Report for the Local Systemic Change through Teacher Enhancement Initiative (Banilower et al., 2005).





# Local Systemic Change Initiative

- NSF funded the first cohort of LSC projects in 1995.
- By 2002, there was a total of 88 projects.
- Projects represented a wide variety of contexts – rural, suburban, urban districts, with widely varying demographics.



# Logic Model of LSC Professional Development

Quality PD Program



Increased Teacher Knowledge/Skills



Improved Classroom Practice



Improved Student Performance





# LSC Program Logic

## Supportive Context for Teaching

- Appropriate curriculum, assessment, materials management
- Time for teachers to plan, collaborate
- Support from administrators
- Support from parents and community

High Quality Instructional Materials

Professional Development for Teachers

Improved Instruction

Improved Student Knowledge, Attitudes, and Skills

## Sustaining Professional Development System

- Capacity
- Structures
- Resources



# LSC Guiding Principles

- Using well-prepared professional development providers whose backgrounds included in-depth content understanding and expertise in K-12 mathematics/ science;
- Establishing a supportive and collegial professional development culture;
- Providing experiences that deepen teachers' knowledge of the mathematics/science content in the curriculum and the pedagogy needed to teach this content;



- Providing opportunities for teachers to explore and become conversant with exemplary instructional materials and the appropriate pedagogy for using these materials in their classrooms; and
- Providing support for teachers in content, pedagogy, and materials over the course of implementation.



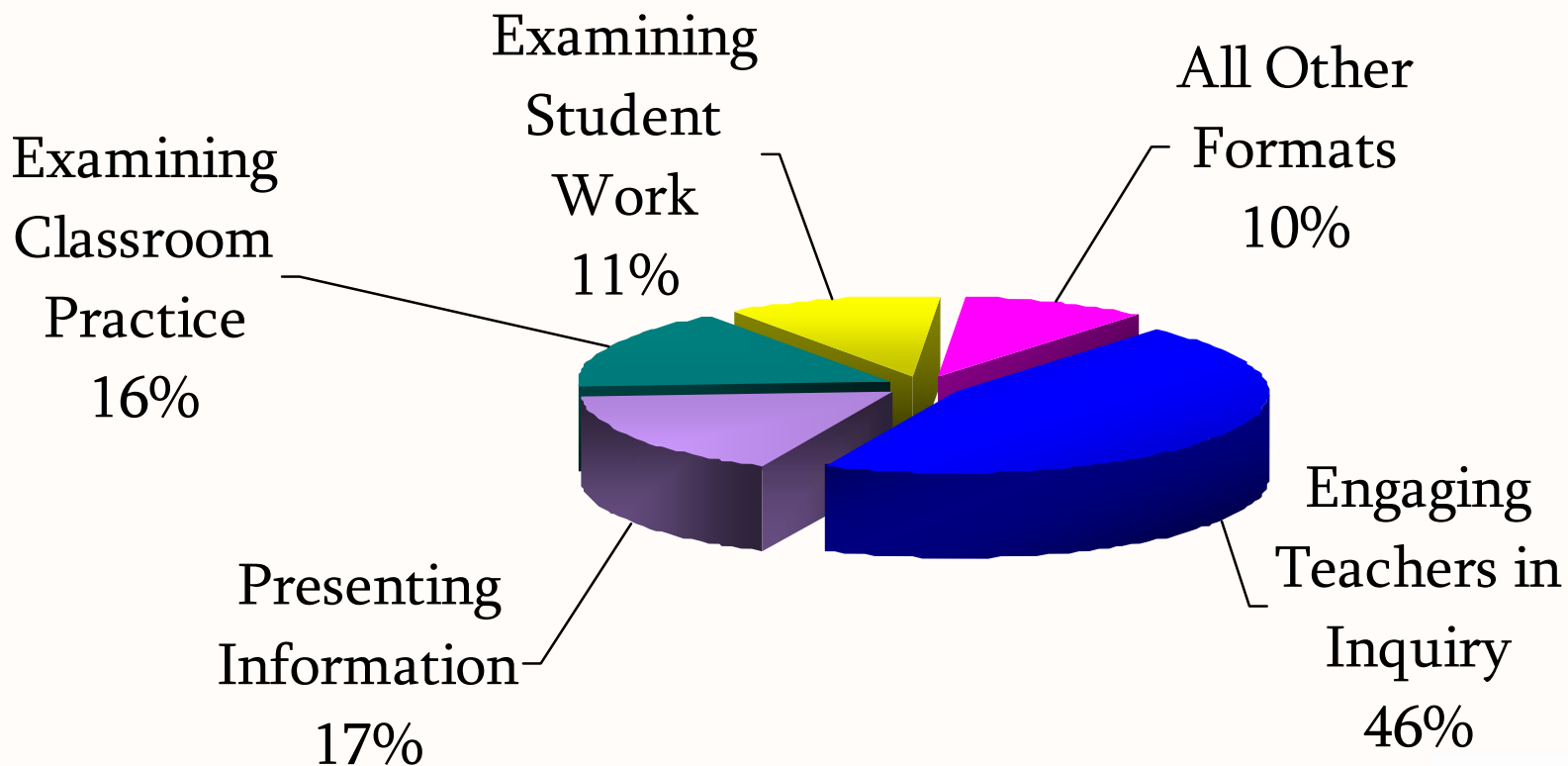
# LSC Professional Development

- Targeted all teachers in a jurisdiction for professional development.
- LSCs were expected to provide each teacher with a minimum 130 hours of professional development, typically over a 5-year period.



# Formats of Professional Development

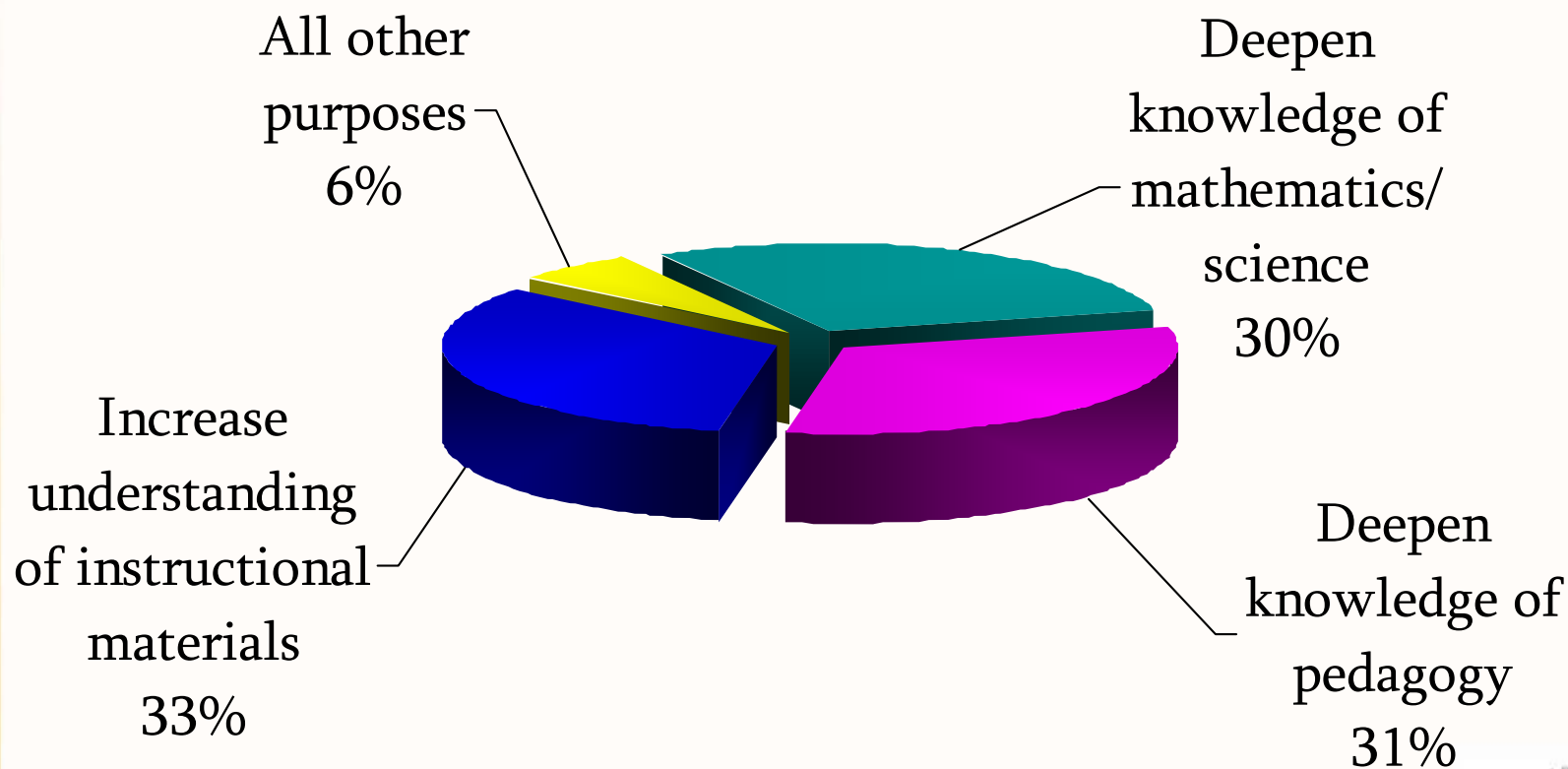
(Average Percent of Professional Development Hours)





# Purposes of Professional Development

(Average Percent of Professional Development Hours)



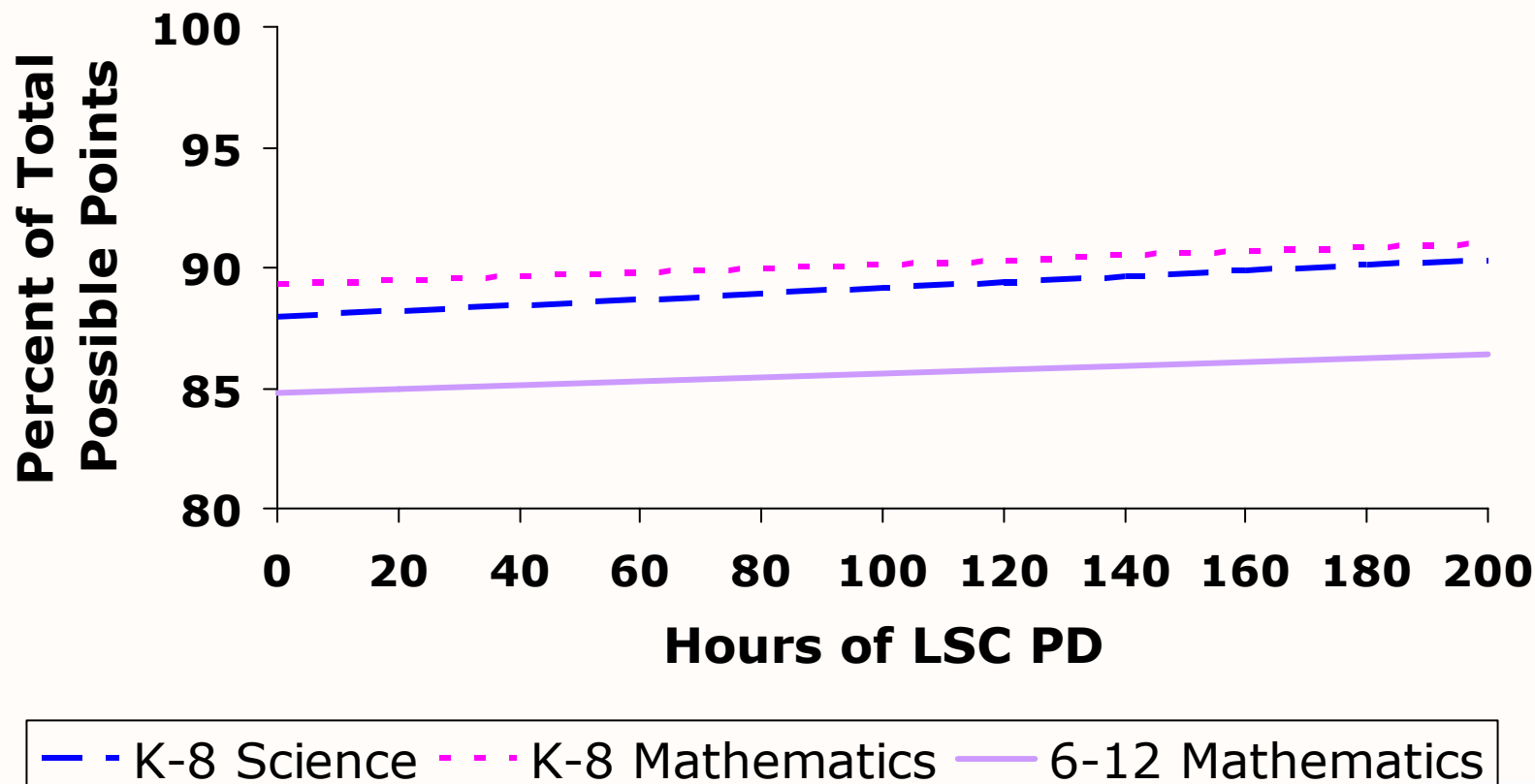


# Findings:

## Impact of LSC on Teachers



# Attitudes Toward Teaching, by Extent of Participation in LSC PD







Teachers reported changes in beliefs about who can learn mathematics and science:

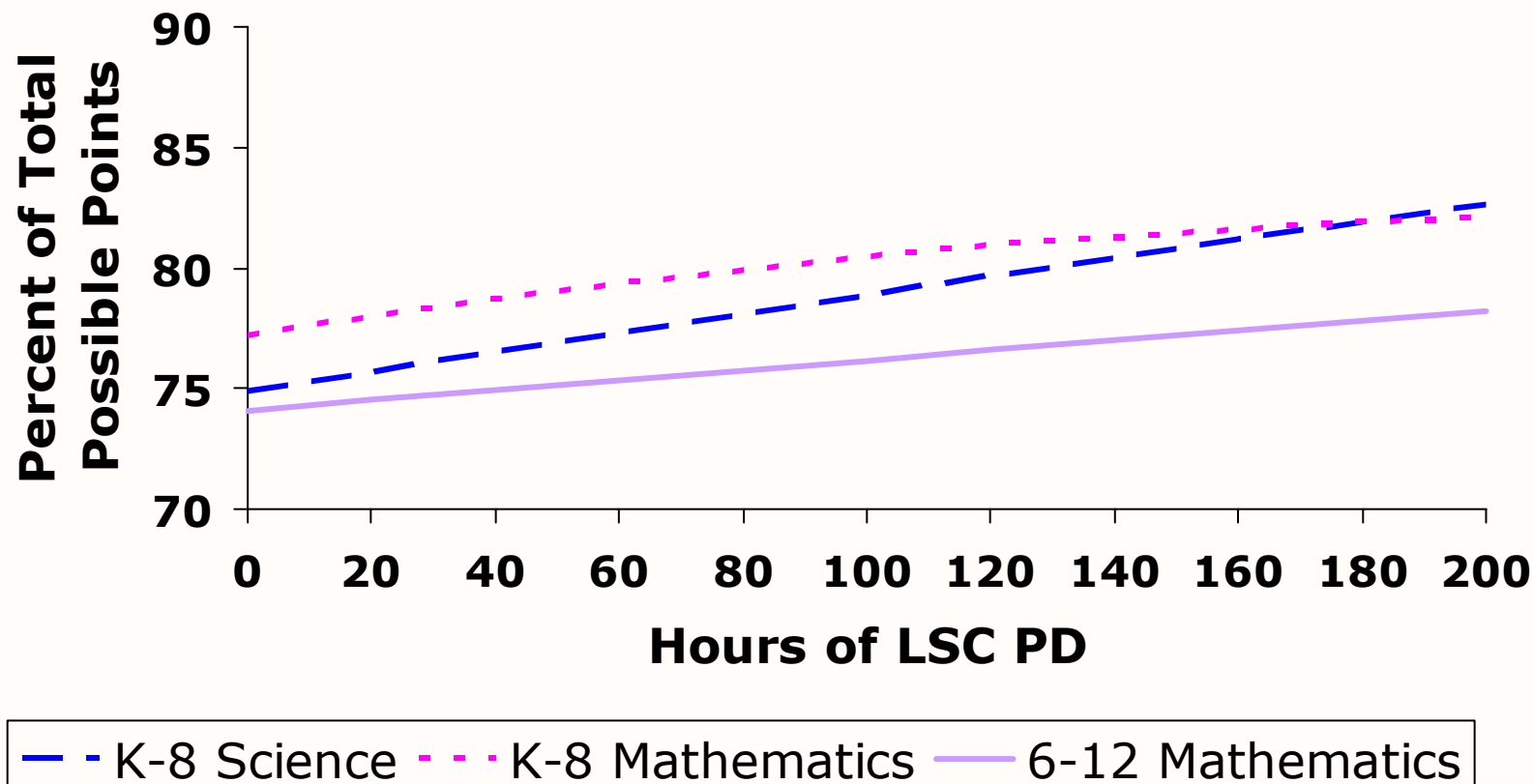
*After the [LSC] summer school, I began to see myself as a teacher who cares very much about rich content matter (such as science) and about scaffolding that content in ways that LEP children can really grasp ideas and language.*  
(Teacher, elementary science LSC)



*I look at student learning completely differently. It opened my eyes to how many different ways there are to come to the same answer...The professional development experience made me realize that kids need time, developmentally, to understand the concepts. (Teacher, K–12 mathematics LSC)*

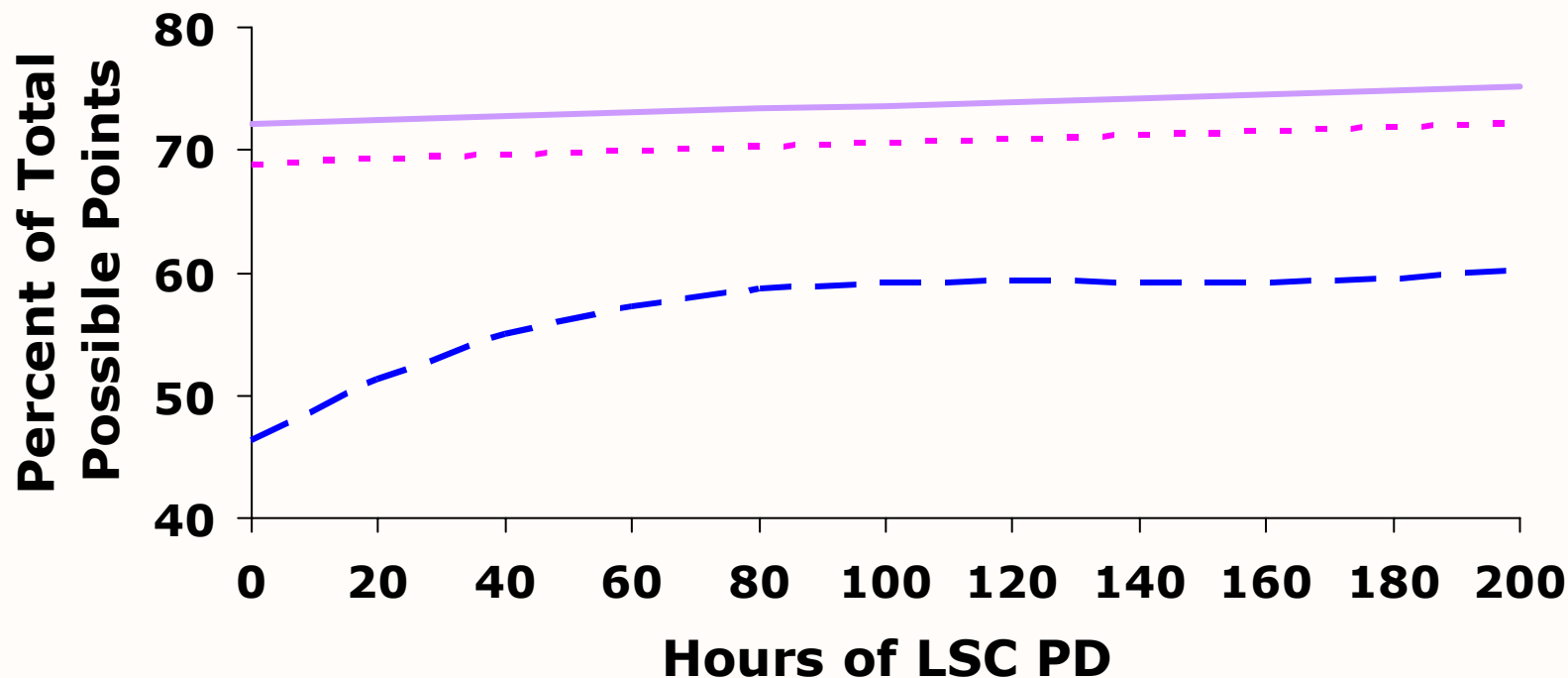


# Perceptions of Pedagogical Preparedness, by Extent of Participation in LSC PD





## Perceptions of Content Preparedness, by Extent of Participation in LSC PD



— K-8 Science    - - K-8 Mathematics    — 6-12 Mathematics



# Findings:

## Impact of LSC PD on Classroom Practices



- Impacts were evident with about 30 hours of LSC PD, typically increased until about 80 hours PD, and then leveled off.

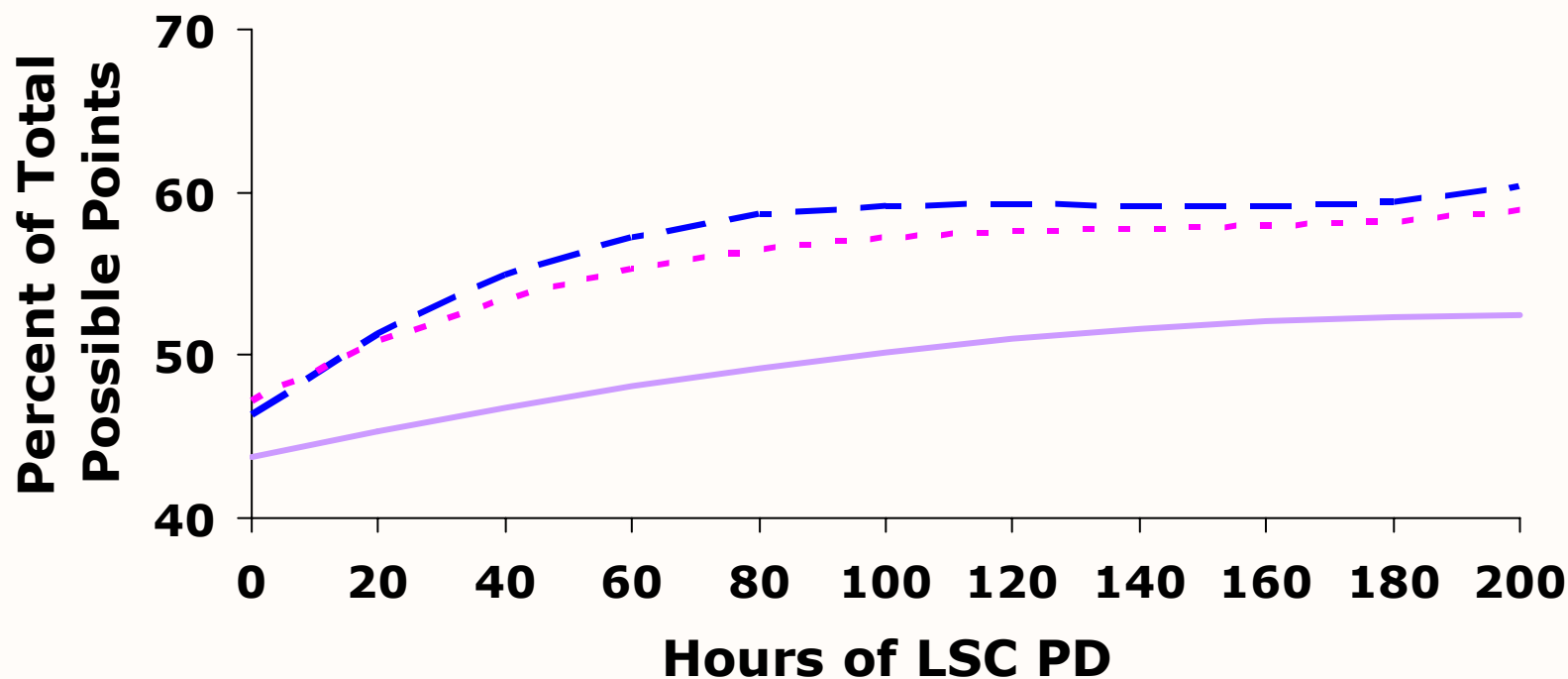


# Cautions:

- More **efficient** PD could get these kinds of modest gains with fewer hours.
- More **effective** PD would continue to get gains well past 80 hours.



## Use of Investigative Teaching Practices, by Extent of Participation in LSC PD

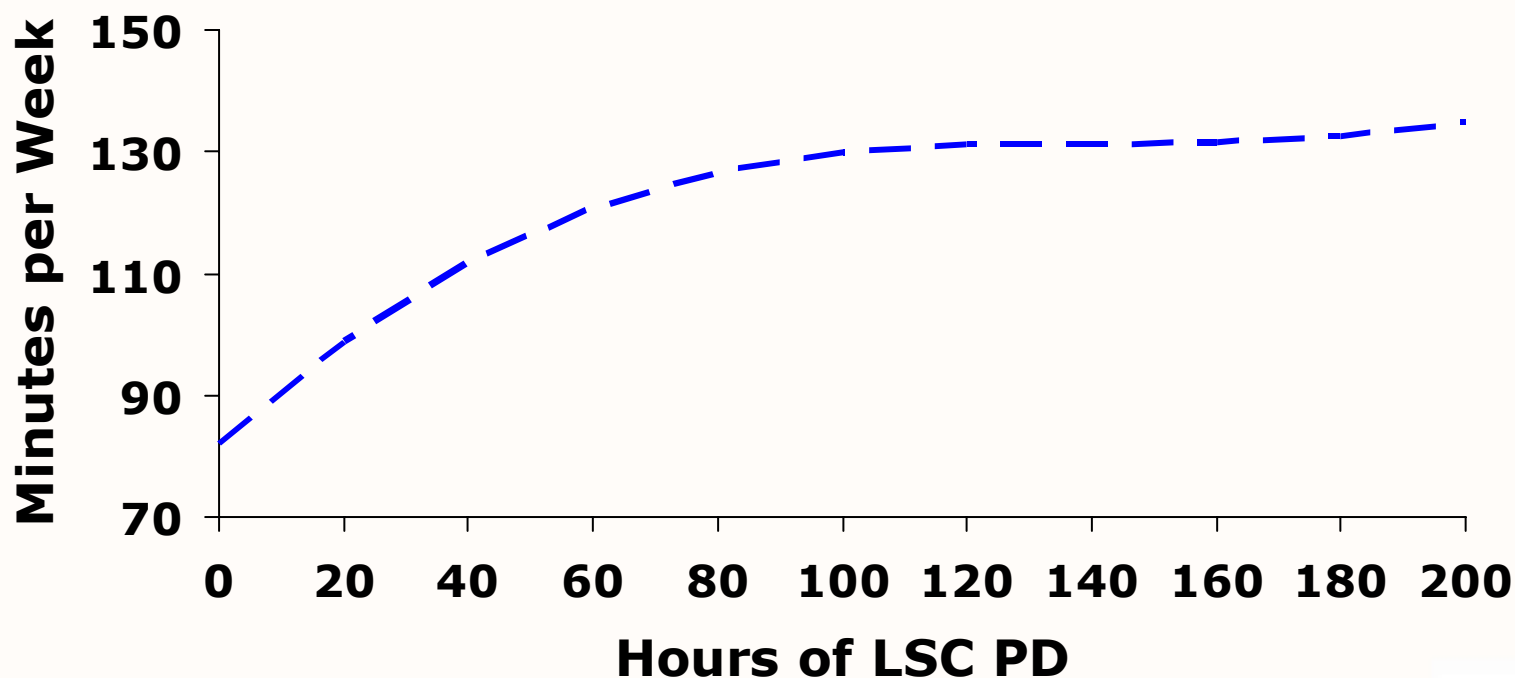


— K-8 Science    - - K-8 Mathematics    — 6-12 Mathematics



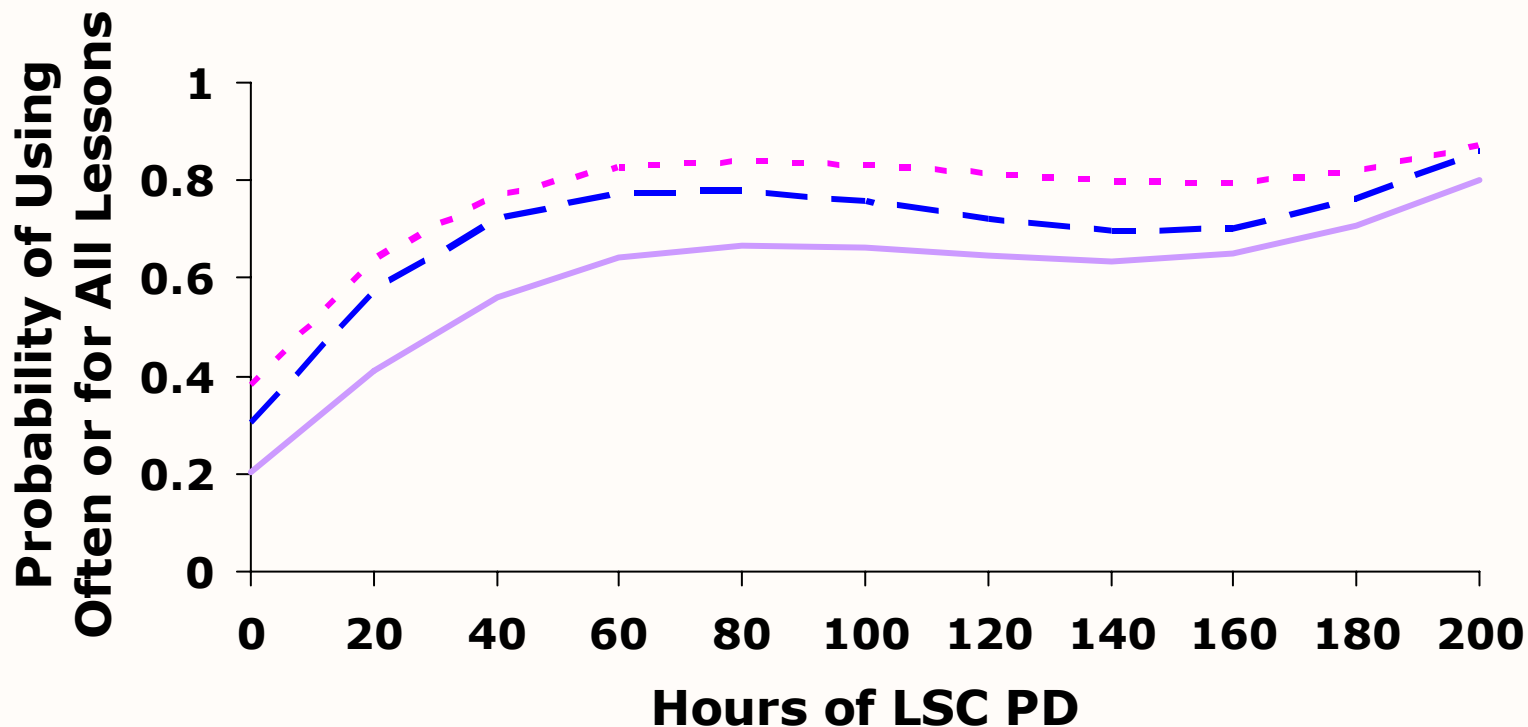


# Instructional Time Devoted to Science (K-5 self-contained classes), by Extent of Participation in LSC PD





# Use of Designated Instructional Materials, by Extent of Participation in LSC PD



— K-8 Science    - - K-8 Mathematics    — 6-12 Mathematics



# In addition...

- After factoring out the effect of professional development, teachers' frequency of use of the designated instructional materials continued to increase over time.



# Principal Support is Very Important

- Teachers' perceptions of principal support was a positive influence on teachers and teaching, beyond the effects of the PD.



*What we found, it was really a function of the principals as to whether [the reform effort] stayed as a priority for the five years.*

*We realized that if principals are not behind you, if they're not supporting you, then you're not going to get a lot of the teachers out. If principals are not behind it, there's little opportunity for change.*



*Never stop working with principals. You can never do enough to get them to understand what this kind of science is all about, what it looks like in the classroom, what it means in terms how it enhances their vision of literacy acquisition. The most important cog in the wheel is the building principal.*

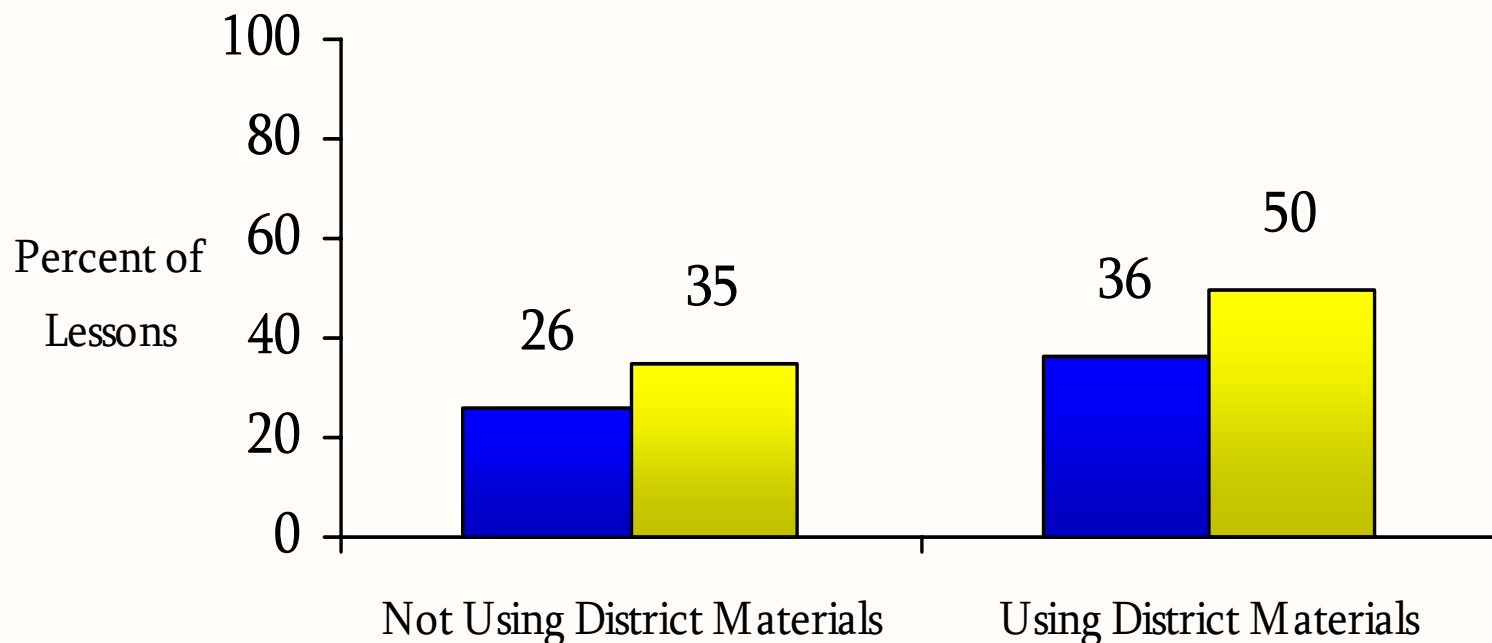


# Key Points

- Professional development matters
- Principal support matters
- Fidelity of implementation matters



# Highly-Rated Lessons, by Use of District-Designated Materials and Treatment



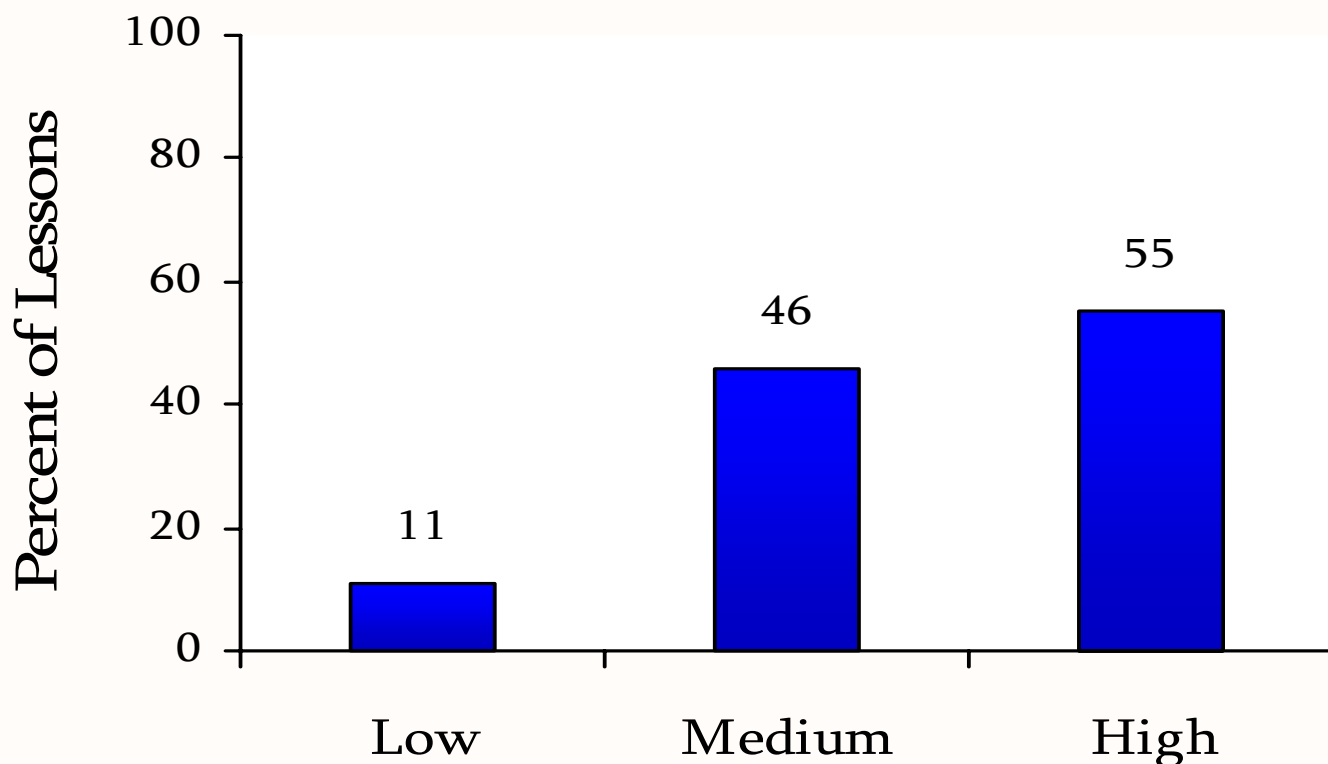
■ 0-19 Hours of LSC Professional Development

■ 20 or More Hours of LSC Professional Development





## Highly-Rated Lessons, by Adherence to District-Designated Materials and Treatment





## **Why were only 50 percent of PD/designated materials lessons highly rated?**

- Based on observations (PIs and evaluators), teachers often focused on the reform aspects of the materials, but the key mathematics/science content sometimes got lost.



- Current thinking of curriculum researchers suggests that PD needs to keep the focus on student learning goals.



- Curriculum researchers also point to the need for student instructional materials that are “educative” for teachers, including describing how each activity/task is expected to contribute to student understanding.



- Such educative materials could be used in PD and would also be an on-going, cost-effective resource for teachers.



- Especially because many student instructional materials do not include such guidance for teachers, PD needs to highlight the concepts being addressed, how they are developed over time, difficulty students many encounter, and how to monitor student understanding.



- The focus of this talk has been on what we have learned from the LSCs.
- SSIs, USIs, and RSIs also worked both on PD and on aligning the system.
- The PD in the earlier interventions varied more from site to site within those programs, as did evaluation measures, so we don't have cross-site results relating hours of PD to impact on teachers and teaching.



- But lessons learned about large scale PD and aligning the system are consistent across these various initiatives.





Breakout sessions today and tomorrow:

LSC, USI, SSI, RSI projects share lessons learned about designing, implementing, sustaining effective PD.



# To summarize:

- Mathematics/science teachers need content-focused PD.



- Basing PD on student instructional materials is a promising strategy.



- PD needs to keep the focus on that content, helping teachers help students learn important mathematics/science.



- Need to select/prepare/support PD providers to carry out content-based, curriculum focused PD.



- Having a shared mission (school-wide/district-wide/state-wide) and getting a critical mass of teachers involved, seems to change the discourse, reinforcing and expanding the impact of the PD.



- Principals need to know what teachers are learning and how they can best support them.



- State/district policies need to send consistent messages aligned with the same vision as the PD.





# References Cited

- Banilower, E. R., Boyd, S. E., Pasley, J. D., & Weiss, I. R. (Prepublication copy, 2005). *Lessons from a decade of mathematics and science reform: A capstone report for the local systemic change through teacher enhancement initiative*. Chapel Hill, NC: Horizon Research, Inc.
- Cohen, D. K. & Hill, H. C. (2000). Instructional policy and classroom performance: The mathematics reform in California. *Teachers College Record*, 102(2), 294–343.
- Elmore, R. F. (2002). *Bridging the gap between standards and achievement: The imperative for professional development in education*. Washington, DC: Albert Shanker Institute.



# References Cited

- Garet, M. S., Birman, B. F., Porter, A. C., Desimone, L., Herman, R., & Yoon, K. S. (1999). *Designing effective professional development: Lessons from the Eisenhower program*. Washington, DC: U.S. Department of Education.
- Hill, H. C. & Ball, D. L. (2004). Learning mathematics for teaching: Results from California's Mathematics Professional Development Institutes. *Journal for Research in Mathematics Education*, 35(5), 330–351.
- Weiss, I. R., Banilower, E. R., McMahon, K. C., & Smith, P. S. (2001). *Report of the 2000 national survey of science and mathematics education*. Chapel Hill, NC: Horizon Research, Inc.



# References Cited

- Weiss, I. R., Pasley, J. D., Smith, P. S., Banilower, E. R., & Heck, D. J. (2003). *Looking inside the classroom: A study of K–12 mathematics and science education in the United States*. Chapel Hill, NC: Horizon Research, Inc.
- Wilson, S. M. & Berne, J. (1999). Teacher learning and the acquisition of professional knowledge: An examination of research on contemporary professional development. *Review of Research in Education*, 24, 173–209.